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Goddard Space Flight Center

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Lunar Data Supports The Idea That Collision Split Earth, Moon

Analysis of data from NASA's Lunar Prospector spacecraft has confirmed that the Moon has a small core, supporting the theory that the bulk of the Moon was ripped away from the early Earth when an object the size of Mars collided with the Earth.

Data shows that the lunar core contains less than four percent of the Moon's total mass, with the probable value being two percent or slightly less. This is very small when compared with the Earth, whose iron core contains approximately 30 percent of the planet's mass.



Artist's rendition of the Lunar Prospector by Boris Rabin, NASA Ames Research Center.

"This is a critical finding in helping scientists determine how the Earth and Moon formed," said Dr. Alan Binder of the Lunar Research Institute, Tucson, AZ, principal investigator for Lunar Prospector.

Similarities in the mineral composition of the Earth and the Moon indicate that they share a common origin. If they had simply formed from the same cloud of rocks and dust, the Moon would have a core similar in proportion to the Earth's. A third theory suggests that the moon was captured fully intact by the Earth's gravity.

Based on information first gathered during the Apollo era, scientists suggested that the Moon was formed when a Mars-sized body hit the Earth during its earliest history. "This impact occurred after the Earth's iron core had formed, ejecting rocky, iron-poor material from the outer shell into orbit," Binder explained. "It was this material that collected to form the Moon.

"Further analysis of Lunar Prospector data to refine the exact size of the lunar core and the amounts of elements like

gold, platinum and iridium in lunar rocks — all of which are concentrated with metallic iron — is required," Binder added. "This will do much to pin down for good if the 'giant impact' model of the formation of the Moon is correct, or if the Moon formed in a different manner."

The current data comes from gravity measurements conducted by Dr. Alex Konopliv of NASA's Jet Propulsion Laboratory, Pasadena, CA. His results indicate that the Moon's core radius is between 140 and 280 miles (220 and 450 kilometers). This result is consistent with independent magnetic data,

evaluated by Dr. Lon Hood of the University of Arizona, Tucson, which suggest that the core radius is between 180 and 260 miles (300 and 425 km).

In other results from Lunar Prospector, Dr. Robert Lin of the University of California at Berkeley, Dr. Mario Acuna of NASA's Goddard Space Flight Center and Hood also found that a broad section of the southern far-side of the Moon has large localized magnetic fields in its crust. These fields occur opposite the large Crisium, Serenitatis and Imbrium basins — three of the "seas" that cover much of the Moon's near side. This result supports earlier evidence linking strong magnetized concentrations on one side of the Moon with young, large impact basins on the other side.

Lunar Prospector conducted its primary mapping mission at an altitude of 63 miles (100 kilometers) for almost one year after its arrival in lunar orbit on Jan. 11, 1998. In December and January, the spacecraft's altitude was lowered to approximately 15 miles by 23 miles (24 kilometers by 37 kilometers). Analyses of data from the lower-altitude observations are expected to further improve scientific understanding of the origin, evolution and physical resources of the Moon.

Further information about Lunar Prospector, its science data return, and relevant charts and graphics can be found on the project website at: <http://lunar.arc.nasa.gov>

NASA Selects Top Inventions Of The Year

The inventor of a device that helps stabilize NASA spacecraft has been selected to receive the NASA Government Inventor of the Year Award. The selection committee also chose a high temperature resin material to receive the NASA Commercial Invention of the Year.

Inventor Charles E. Clagett, a Goddard Space Flight Center, Greenbelt, MD, employee and Associate Head of the Component and Hardware Systems Branch received the honor for the "Apparatus for Providing Torque and for Storing Momentum Energy."

Commonly known as the SMEX Reaction/Momentum Wheel, the device was developed for NASA's Small Explorer program (SMEX). A compact mechanism was needed that could accelerate at a high rate with little vibration to fulfill the missions' science requirements. The wheel's compact design is durable with at least a four-year life expectancy while providing improved performance and better stability for a spacecraft and significantly reducing vibration.

This reaction wheel invention has been highly successful on the last two Small Explorer missions, the Transition Region and Coronal Explorer and the Submillimeter Wave Astronomy Satellite. The high acceleration rate and low vibration device allows detection of signals that would have been obscured by previous reaction wheels.

NASA's Commercial Invention of the Year goes to Langley Research Center's Phenylethynyl Terminated Imide Oligomers (PETI-5). This material can be used as a glue that holds fibers together and as an adhesive in a variety of aerospace and commercial applications. Langley inventors Paul Hergenrother, Joseph Smith and Brian Jensen were awarded three patents on the novel material.

PETI-5 was originally developed for high-speed, high-temperature aircraft applications because it is strong and lightweight. Its exceptional combination of properties has attracted the interest of U.S. industry. PETI-5 products are now commercially available and have resulted in about \$10 million in sales.

Wallops Shorts.....

The Wallops Fiscal Operations Section has moved. The payroll, travel, and commitment offices are located on the third floor of Building E-105. Call Sandy Bowden, x1060 for further information.

Health Hints

by Linda Hood, Health Unit

Women and Nutrition

Breast cancer, osteoporosis, iron deficiency, weight reduction, What do these things have in common? They are either unique to women or are more prevalent in women. They also affect current recommendations on what women should eat to maintain good health.

New recommendations on foods that are healthy and foods that are not so healthy surface almost daily. There are some basic guidelines that have taken root over the past several years. The bottom line, which also is known as Dietary Guidelines for Americans, is:

- * eat a variety of foods
- * maintain healthy weight levels
- * choose a diet low in fat, saturated fat and cholesterol
- * choose a diet with plenty of vegetables, fruits and grain products
- * use sugar and salt/sodium only in moderation
- * if you drink alcoholic beverages, do so in moderation.

American Federation of Government Employees Luncheon - April 6

11:30 a.m.
Williamsburg Room
Speaker: Mark Williams

Surplus Auction

Bldg. F-3
April 7
Beginning at 9 a.m.

Inspection: Bldg. N-222
April 6 - 9 a.m. to 3 p.m.
April 7 - 8 a.m. to 8:45 a.m.

PARTIAL LISTING: fax machine, computers, printers, plotters, monitors, typewriters, electronic equipment, safes, surveillance cameras, TV's, miscellaneous video equipment; ice machine, water cooler, air compressor, pressure washer, miscellaneous parts for MB-5 Oshkosh fire/crash truck VEHICLES: Chevy S-10 Pickups (four 1985's and one 1988), 1989 Chevy Celebrity, 1993 Chevy Corsica, 1993 Ford Taurus station wagon

For complete listing visit: <http://sales.gsfc.nasa.gov>

Mastercard, Visa, cash or money order will be accepted. No personal checks and no refunds. Everything sold as is. Letters of credit must be faxed to 757-824-1619 or delivered to Bldg. N-222 by 3 p.m. on April 2.



Sister Maura McCartin (above), Pastoral Associate at St. Francis de Sales parish in Salisbury, MD. was the guest speaker for a brown bag lunch held March 25. Her presentation, "Companions on the Journey" (Finding the Extraordinary in the Ordinary), was sponsored by the Wallops Federal Women's Program as a part of Women's History Month activities.

Mark Your Calendar

There will be a Federal Employees Group Life Insurance (FEGLI) open season from April 24 through June 30. All eligible employees may make election changes to increase their coverage during this time. This open season includes changes in the "Basic", "Option B", and "Option C", coverage. An announcement will be published at a later date with further enrollment information.

April 14 is Earth Day - The Public Affairs Office will have a display at the Salisbury Zoo. Anyone interested in helping staff the exhibit is asked to call Tony Goodyear, x1681.

Introduction to Word

DATE : April 14, 1999
TIME: 8:30 a.m. to 4 p.m.
LOCATION : Wallops Flight Facility
COST PER STUDENT : \$120
FUND SOURCE : Directorate

A Training Request is required. Code 800 Training Requests should be routed through Sherry Kleckner, Bldg. F-6. All other Training Requests with appropriate signatures may be faxed to Code 114 at x66-1679.

Non-NASA Federal employees may register by submitting a copy of their Training and Purchase Requests. Contractor employees will be admitted on a "space available" basis. For further information contact Laura Potler, x66-4853.

Retail Sale of Surplus Computers

Bldg. F-3
April 6
Noon - 2 p.m.

Inspection: April 6
11 - 11:45 a.m.

PARTIAL LISTING: 28 Pentium 486's, six 486 IBM compatible & six Macintosh systems (including monitor, computer and keyboard), 2 Mac laptops, 3 laser printers, 1 scanner. 75-100 MHz, 32 mb RAM, 500 mb to 1.7 gb hard drives, power MACS

Systems are already priced and must be paid for by 2 p.m. For a complete listing, visit: <http://sales.gsfc.nasa.gov>

Mastercard, Visa, cash or money order will be accepted. No personal checks and no refunds. Everything sold as is.



Steak (grilled to order), tossed salad, baked potato, corn on the cob, bread, dessert and beverage \$15.00 per person.

Tickets are available from Sandy Gunter, Bldg. F-3, x1454 or Pam Milbourne, Bldg. E-2, x2020.



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